

$$20 + 64 =$$

Starcade

presents

SAVAGE POND

**ATARI™
COMMODORE
64™**

**BBC (B)™ &
ELECTRON™**

£8.95

DISK OR CASSETTE

A truly remarkable depiction of life cycles in a freshwater environment. A semi-educational programme with high resolution graphics, crammed with thrills, spills and excitement, featuring:

Amoeba (Rhizopoda); **Hydra** (Chlorohydra Viridissima); **Dragonfly** (Erythromma Najus); **Bloodworm** (Phylum Platyhelminthes); **Jellyfish** (Craspedacusta Sowerbeii); **Beetle Larva** (Macrolea Leachi); **Spider** (Argyronata Aquatica); **Water Fleas** (Scapholeberis Mucronata); **Bumble-Bee** (Bombus Lapidarius); and our special guest star

THE COMMON FROG
(Rana Temporaria)

Awesome . . . in its conception
Brilliant . . . in its depiction
Dynamic . . . in its execution

"Savage Pond is a real joy. A totally unique concept, well thought out and superbly programmed. Whilst a far cry from the usual arcade action it retains all of the excitement. It is an ideal family game and children and adults alike will marvel at the graphics and storyline . . . you will not find such an original and compelling game anywhere else. Buy it and sit back knowing that one of the most original games ever programmed was written here in Britain." — PAGE 6 — an Atari Users Magazine.

DISTRIBUTED BY

CENTRESOFT
(021-520 7591)

P.C.S.
(0254-691-211)

LIGHTNING
(01-969 5255)

CALLISTO
(021-643 5102)

TIGER
(051-420 8888)

IF IN
DIFFICULTY
RING OUR
SUPERFAST
CREDIT CARD
SALES LINE:

051-487 0808 (24 hours)

**ASK YOUR
LOCAL DEALER
OR
POST THIS
COUPON**

STARCADE SOFTWARE, 2 Elworthy Avenue, L26 7AA.

Please rush me copies of **SAVAGE POND** suitable for Atari/Commodore 64 (DISC/CASSETTE).

Please debit by Access Card (Delete as necessary.)

Card Number

I enclose Cheque/P.O. for £.

Name

Address

HCW60

In spite of the many criticisms made of the BASIC 2 in the VIC-20 and Commodore 64, these machines have a particularly useful virtue — their flexibility. Or, to put it another way, expandability.

Both are equipped with user, games and expansion ports. Via these it is possible to interface to a wide range of hardware add-ons. The value of this standard on-board hardware is demonstrated when one considers how many extras must be purchased to use joysticks and Micro-drives on a Spectrum.

The aim of this article is to present a review of the hardware add-ons available for the VIC-20 and Commodore 64.

Clearly, it is not feasible to cover all of them here. Consequently, I will review a selection. The basic criterion for selection was that, as far as possible, I have personally used the add-ons. Some items, because of cost or difficulty in getting review specimens, do not fulfil this criterion. These are marked with an asterisk (*).

Using this approach, while I don't cover all the bits and pieces available, I can vouch for those I do discuss.

Similarly, there will be a number of manufacturers whom I will not mention. Quite possibly such manufacturers will be able to offer cheaper products than those reviewed. If so, my apologies. However, due to limitations of space, I cannot cover every product available.

To assist you in finding the sections you want, I shall cover the hardware under the headings of their generic classes, e.g. Memory Expansion, Toolkits and so on.

The first real problem

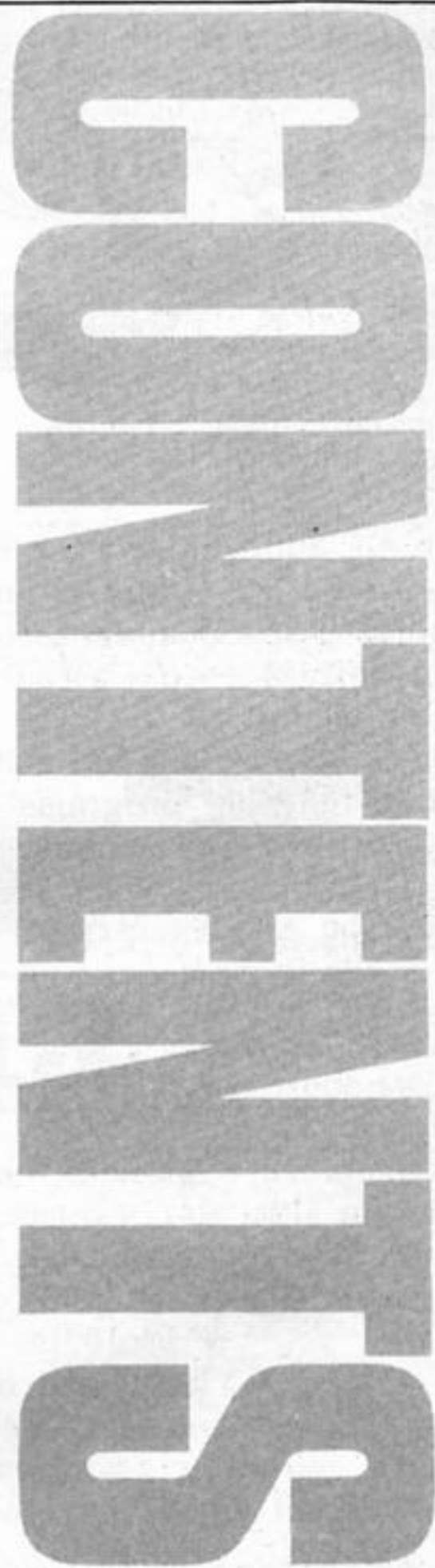
was to establish which products fell within the sphere of this review. The

simple answer is: any product which uses a piece of hardware. I will, for

example, mention ROM-based Forth but not Forth on cassette or disc.

Your guide to add-ons for the VIC-20 and Commodore 64

Memory	five
Toolkits	five
Joysticks	five
Machine code monitors ...	five
Motherboards	five/six
Assemblers	six
Fast savers	six
Graphics aids	six
IEEE interfaces	six
Languages	eight
Radio teletype	eight
Light pens	eight
Webb's winners	eight
Where to find them	eleven
Commodore 64 programming	twelve
VIC-20 program	twenty
CBM 64 Pixel-Pad ..	ten/fifteen

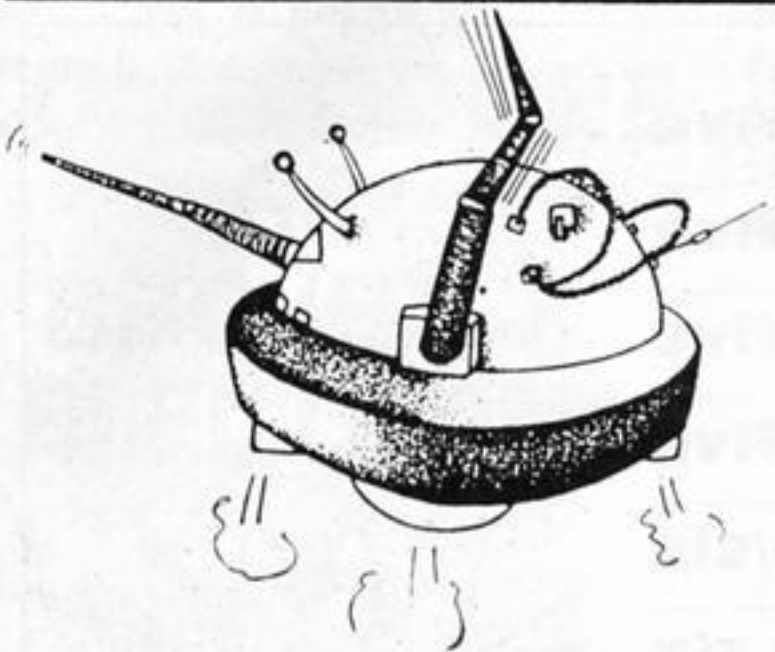


User's Guide

All the Best

BASIC
Adventures
in Space

£9.95



for all children from 7 to 77
Learn BASIC, while enjoying this exciting space adventure. Master the computer to escape from the Alien Planet.

Course contains four computer-aided learning programs to teach major BASIC commands. Available for the CBM 64, VIC 20 (and BBC, Electron and Spectrum!)

Beginners BASIC
course for the
Commodore 64

£10.50

A complete beginner's course for the CBM 64. Assumes no prior knowledge and teaches by

STOP PRESS
contains
Honey.Aid 1

means of
projects.

Software contains character generator, sprite generator, synthesiser and all six games developed in in the text. Also Honey.Aid 1 Adds 28 NEW commands to CBM 64 BASIC.

Available from: W.H.Smiths, BOOTS, many SPECTRUM stores, all good computer shops and many bookshops.

Courses also available for BBC, ORIC, ELECTRON, APPLE, DRAGON, SPECTRUM, LYNX.

Courses for the CBM 64 and VIC-20

BEGINNERS ASSEMBLY
LANGUAGE COURSES
FOR CBM 64 or VIC 20

£12.50

A complete beginner's course:
contains a full two-pass assembler
featuring:

- Labels
- Macros
- Hardcopy
- Memory labels
- LOAD/SAVE
- Insert/delete

Also Binary/BCD/Hexadecimal tutor to explain the maths used in machine-code programming. Covers whole 6502/6510 instruction set.



Honeyfold Software Limited
Standfast House, Bath Place,
High Street, Barnet, London.
01-441-4130

HONEYFOLD

MEMORY

Probably the first add-on purchased by many VIC owners will be some kind of memory expansion. After a slow start, the number of firms producing these has increased. Most expansions are of the cartridge format with a fixed block of RAM (generally 3K, 8K or 16K). One or two of the 16K packs also contain the option of changing the memory configuration.

There are also one or two firms offering 32K and 64K memory packs, but be warned such extra RAM is really only of value to the machine code user (the 6502 chip can only address 64K and a large slice of that is pinched by ROM etc.)

In my view the firms worth consideration are Commodore (3K, £19.95; 8K, £29.95; 16K, £34.95), Stonechip Electronics (16K switchable, £34.95) and Adman * (8K, £39.95; 16K, £49.95).

Stack Computers does a rather nice RAM board. The value of this is that you can add chips (6116) as and when you like and any memory configuration can be set up. I've had one for a couple of years without any problems (basic board with 8K and toolkit, £39; extra 8K, £18; extra 4K, £10).

Since the 64 already has a full complement of RAM, I don't know of any RAM add-ons for it.

TOOLKITS

One of the weaknesses of the Commodore BASIC is the absence of commands which ease the task of writing and debugging programs. As a consequence, a number of firms have produced add-on ROMs which extend the number of commands available. Typical of these commands are DELETE, RENUMBER, AUTO, TRACE and so on.

Two types of hardware are used, cartridges and ROM chips. The latter require a socket on an expansion board, e.g. Stack storeboard or Stonechip's motherboard.

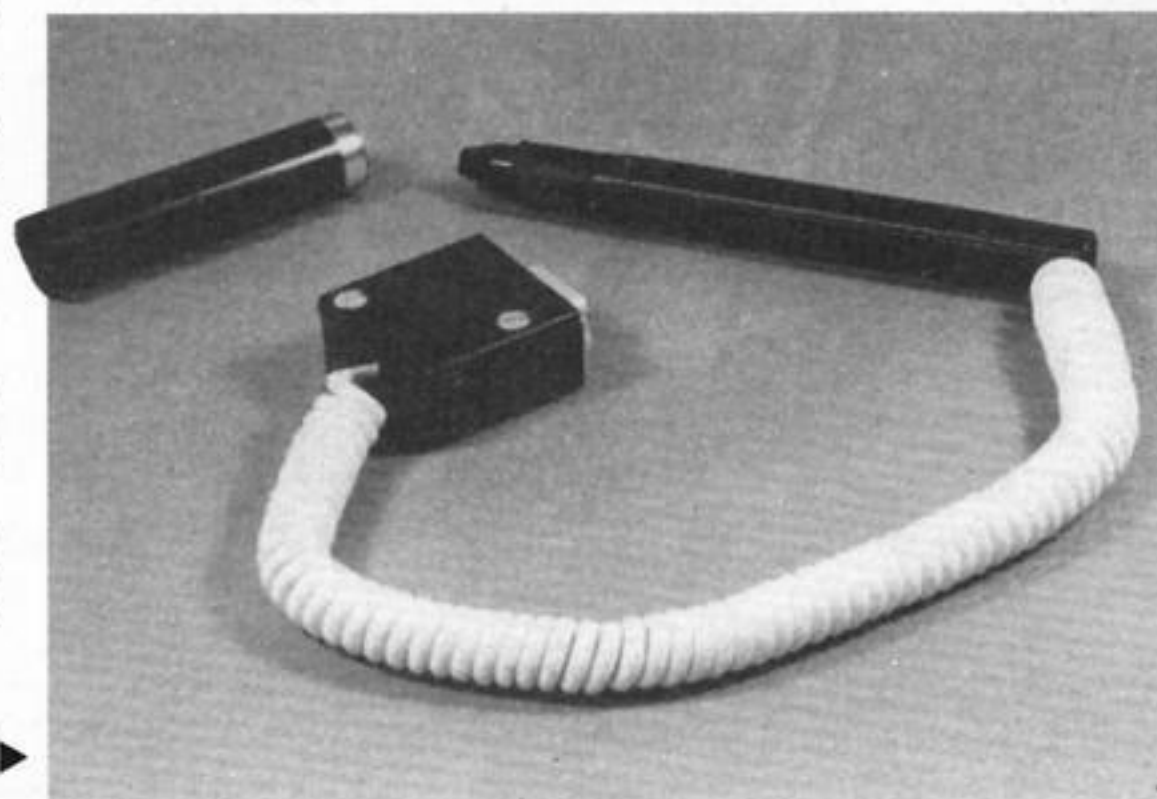
● Light pen from Stonechip ►



Some worth looking at are Stack's VICKIT 1 (£23 ROM or £28.75 cartridge) and VICKIT 2 (£27 and £40.25), Stonechip (BASIC Plus £14.95 as ROM or £22.45 as cartridge), Audiogenic (BUTI Plus £39.95 cartridge), Commodore (Programmer's Aid Cartridge, £32).

Some packages include 3K of RAM: BUTI Plus by Audiogenic (see above) and Supercharger Plus by Stack. For those with more than one ROM, Stack makes a multi-ROM carrier at £14.

For the 64 toolkits are available from: Stack * (Help, £25; Super Help, £35; Arrow, £29; and Arrow Plus, £39), Supersoft (Arrow, £39; Victree, a toolkit plus BASIC 4 disk commands — highly recommended, £49), Commodore * (Simon's BASIC...£45).



JOYSTICKS

Owners of Commodore computers are fortunate in that they can plug a joystick straight into the computer without recourse to an add-on interface. Unlike the other items discussed in this review, choice of joysticks is really a matter of personal taste and size of your bank balance.

If your budget is limited, I would suggest the Atari joystick. At about £7, it is cheap and will take a lot of hammering. (Don't buy the Commodore joystick since it is only an Atari with a new paint job). A little more expensive is the Spectravideo Quickshot Stick which offers a moulded handle and a fire button on the top. Not bad value at about £10, but perhaps less sturdy than the Atari.

● IEEE-488 interface from Stack

I've used both of these sticks and can recommend them.

For completeness, I'll mention a few others which I have not used but appear to be good value. Suncom * markets four joysticks which look rather tasty. They seem to cover the full range of types available and look like value for money. Spectrum users will know of the Kempston Competition Pro * (£14.50). It looks handy and no interface is necessary for Commodore computers.

For the more adventurous, Stonechip makes a stick using mercury switches * (£20). Instead of using the normal mechanical switch, the joystick reacts to the angle at which it is held. Given practice, this arrangement gives much more precise control without getting cramp in your wrist.

MACHINE CODE MONITORS

Owners of Commodore PETS have an advantage over VIC and 64 owners in that they have a machine code monitor on board in ROM. We VIC and 64 owners must buy one separately. In case you don't know what it does, a machine code monitor enables you to perform a wide range of actions on machine code and memory contents and it's really a must for the serious computer freak.

For the VIC owner I suggest: Commodore (Machine Language Monitor Cartridge, £28), Audiogenic (BUTI Plus see Toolkits, Monitor, £29.95).

For the 64: Stack (Help and Superhelp, see Toolkits), Supersoft (Zoom Monitor, at £25 probably the best available) and Audiogenic * (Monitor, £29.95).

MOTHER-BOARDS

Both the VIC and 64 have only one expansion port. Consequently it is necessary to remove the resident cartridge before using a new

● **Four-slot motherboard with ROM socket from Stonechip**

one. A large number of insertions and removals can damage the gold plating on the cartridge edge connector and subsequently cause problems.

The solution is a motherboard with several sockets. You can then have all your cartridges in place all the time and switch any one in when you want. The better known manufacturers are Commodore * (six-slot board for VIC, £59.95), Adman * (three-slot board for VIC, £19.95), Stack (four-slot boards for VIC, £24, and four-slot board for the 64, £29), Stonechip * (four-slot board plus ROM socket for VIC, £31.95).

The switching of the cartridges is normally by mechanical switches although it is not clear how the Commodore board does this.

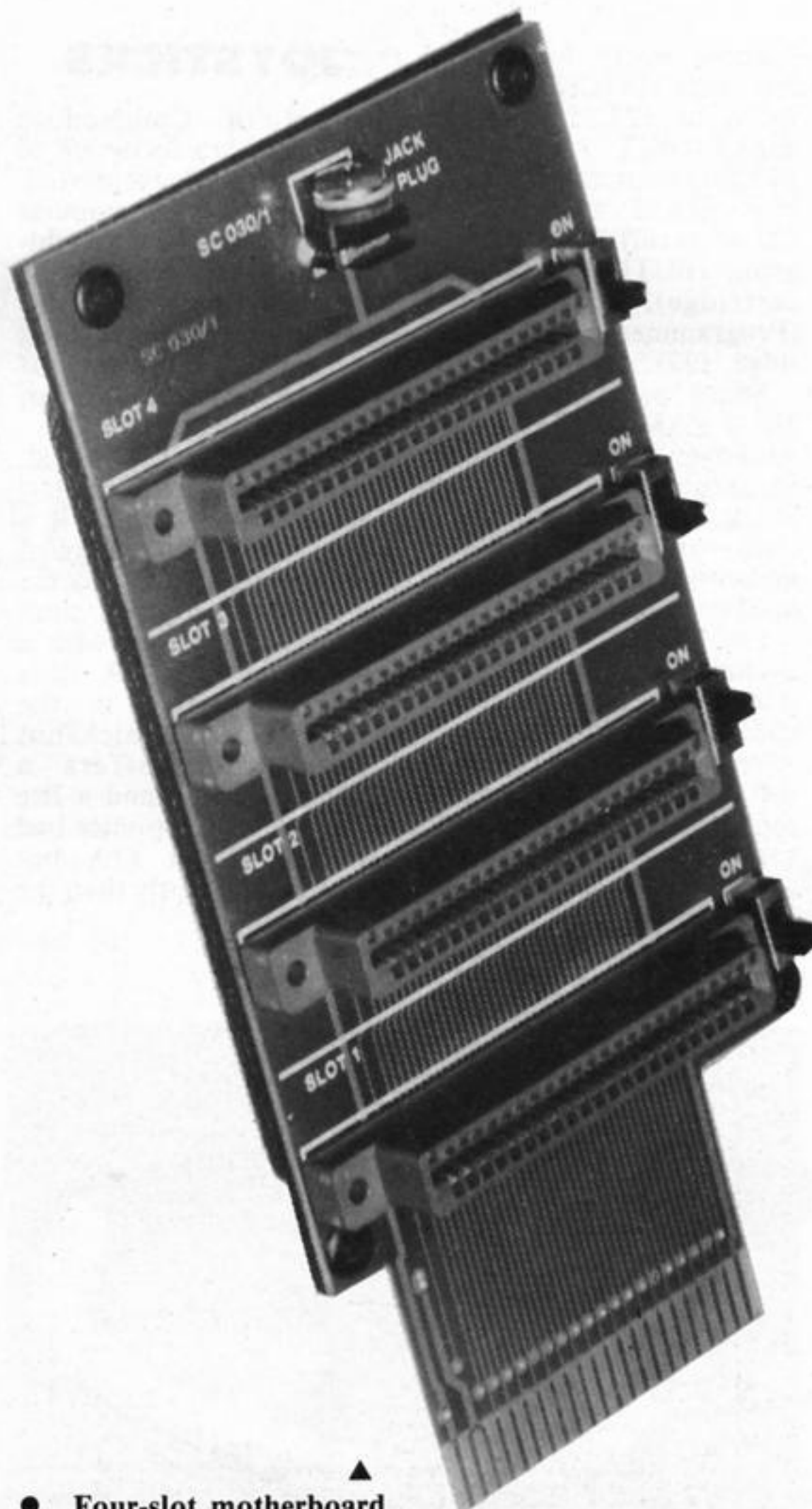
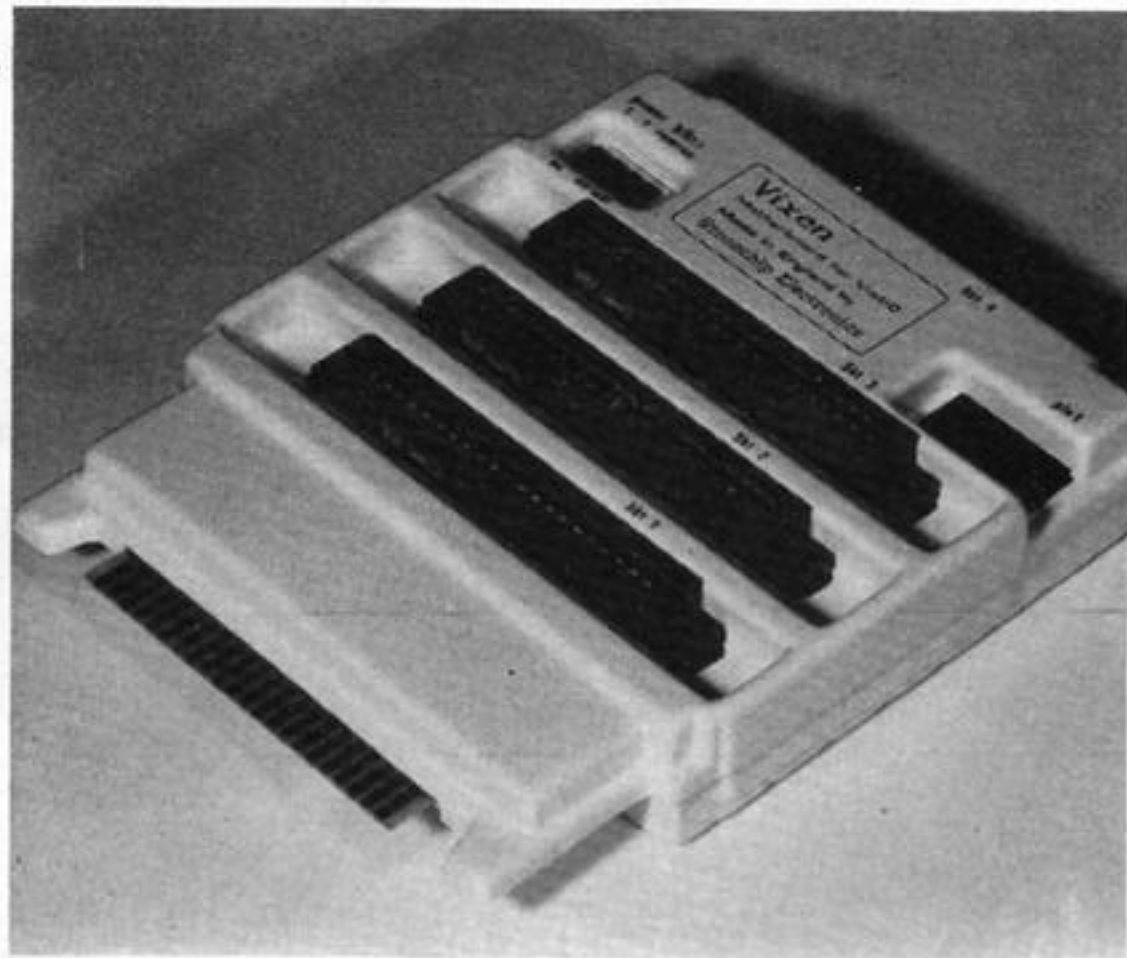
ASSEMBLERS

For machine code routines of significant size there is no alternative to the use of an assembler. A decent one should include a monitor, standard pseudo-op codes and operate with at least two passes. For the VIC: Audiogenic (MIKRO Assembler, £49.95 and excellent) and Stack * (VICKIT 5, £33.35). If you have a 64 you could do a lot worse than get Supersoft's Mikro Assembler (£50).

FAST SAVERS

It's a sad fact of life that most of us can't afford a disc drive. It's even sadder how long it takes to load a large program from cassette. In an attempt to make life a little happier for those of us with only cassette units, some firms have produced aids to help. These devices save and load programs at speeds several times faster than the normal routines.

Programs saved using such aids cannot be loaded normally. If you have the spare cash, these aids are worth a look: Stack * (Hi-Speed Cassette for the VIC, £33.95; Arrow and Arrow Plus for the 64, see Toolkits) and Supersoft's Arrow for the 64 (£39).



● **Four-slot motherboard for the Commodore 64 from Stack**

GRAPHICS AIDS

The VIC and 64 have a lot of untapped graphics ability which, due to the lousy BASIC, are not immediately available to the user. In a belated attempt to make amends Commodore has issued software for both. But, overall, it's been other companies which have come to the rescue.

Most packages enable you to make high resolution pictures using such standard commands as DRAW, POINT, CIRCLE, FILL and so on. I personally feel that such aids are of great value and offer a lot of scope.

The products I know of are: Stack (VICKIT 2, £40 and VICKIT 3, £33 — very versatile but do not support multicolour graphics directly), Commodore, (Superexpander plus 3K RAM, £31 — easy to use but crudely written), Supersoft (MIKRO Assembler, ... graphics added to fill space but commands are very good. See under Assemblers).

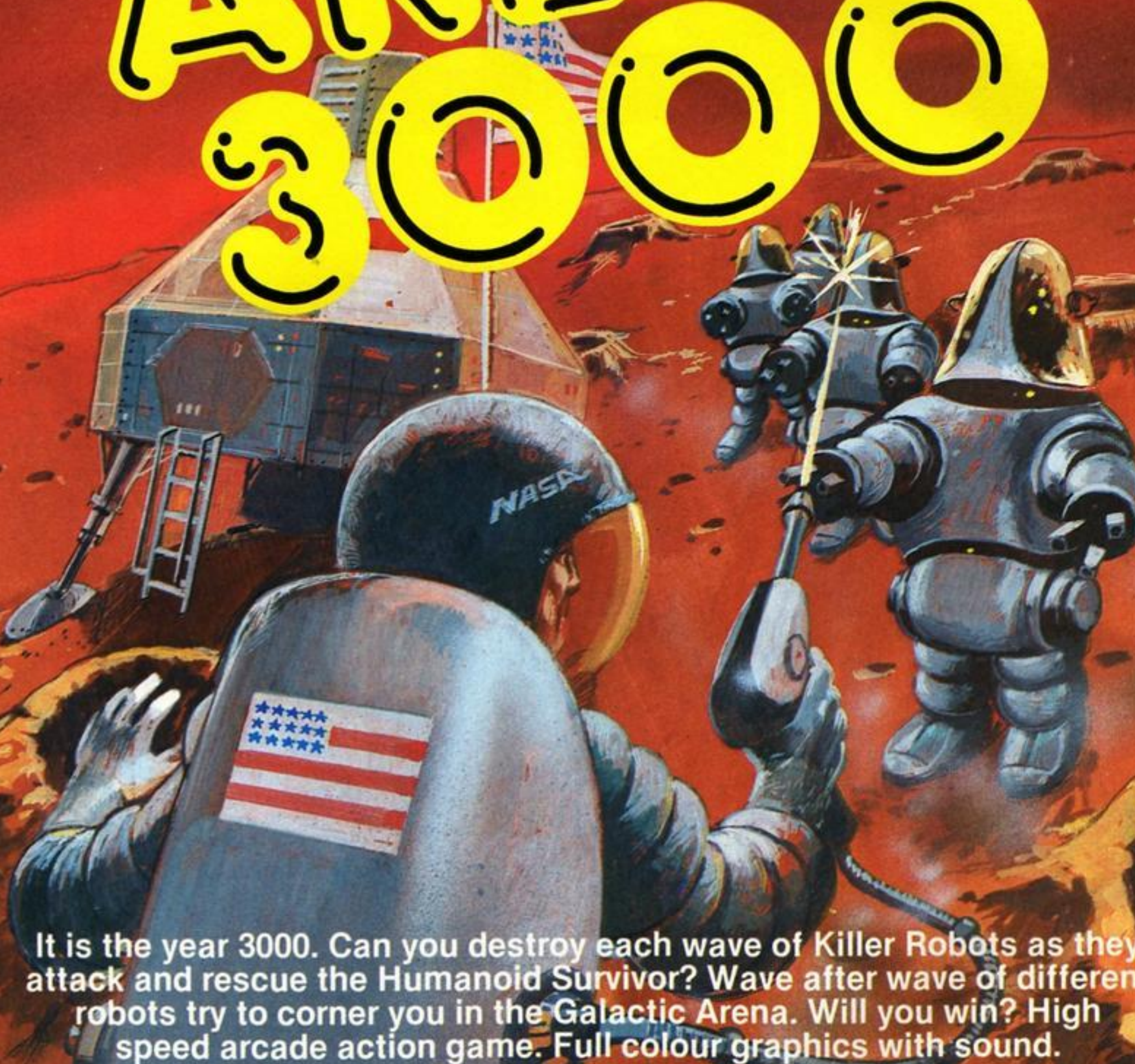
For the 64 there are some excellent cassette and disc based dedicated packages. In hardware there are Simon's BASIC from Commodore * (£50 — expensive, poor reviews) and BC BASIC from Kuma Computers * (£49).

IEEE INTERFACES

Apart from being good games machines, Commodore computers are also well equipped to perform many serious tasks. One way of getting the machine to talk to the outside world and perform such tasks is via the IEEE bus. The disc drive and printer use a sort of IEEE through the serial port, but for a proper IEEE, you must get an interface. Several are on the market. I have not tested them. Some suppliers are: Stack * (IEEE-488 cartridge, £45 for VIC & 64), JCL * (VIC and 64, £59), Oxford Computer systems * (Interpod for VIC and 64, includes RS 232, £99.95), DAMS, now named Computapix * (VIC and 64, £62.10, includes Centronics interface).

Now for 6
major Home Computers

ARENA 3000



It is the year 3000. Can you destroy each wave of Killer Robots as they attack and rescue the Humanoid Survivor? Wave after wave of different robots try to corner you in the Galactic Arena. Will you win? High speed arcade action game. Full colour graphics with sound. Machine Language.

AVAILABLE FOR:

COMMODORE 64—Tape £8 Disk £9.95; ATARI 16K—Tape £8 Disk £9.95; BBC MODEL B—Tape £8 Disk £9.95
ACORN ELECTRON—Tape £8; ORIC 16/48K—Tape £5.50; SPECTRUM 48K—Tape £5.50

Mail Order Sales from
Microdeal Mail Order 41 Truro Rd,
St. Austell Cornwall PL25 5JE

Credit Card Sales
Phone 0726 3456



Dealers Contact

MICRODEAL DISTRIBUTION
0726-3456

or **WEBSTERS SOFTWARE**
0483 62222

MICRODEAL

Selected Microdeal Titles available from computer dealers nationwide or from larger branches of

John Menzies and
Stores



- Range of VIC-20 cartridges, plus four-slot motherboard, from Stack

LANGUAGES

A much neglected area. The strength of the Commodore machines is the ease with which alternative or extended languages can be installed. As far as I know, however, the only languages available in the UK are Forth and extensions to BASIC.

For the VIC try Audiogenic's Forth (£24.95 or £39.95 with 3K of RAM). For the 64 there is also Forth by Audiogenic (£29.95). There is also a Forth package from Kobra * (£28.95).

If you are cheesed off with the paucity of commands in CBM BASIC, there are two packages available for the 64: Simon's BASIC (see Graphics aids) and BC BASIC from Kuma (£49). BC BASIC offers fewer commands but is significantly superior to Simon's BASIC.

RADIO TELETYPE

The home computer has been adopted by many radio hams to assist in the receipt and transmission of morse. I've only seen adverts from one firm, Computer World. It produces RTTY boards for both the VIC and the 64 (64 board costs £139). I haven't seen this product and, since the firm is Dutch, I cannot vouch for it.

- Interpod, the IEEE and RS 232 interface for the VIC-20 and CBM 64, from Oxford Computer Systems



SPEECH SYNTHESIS

Nearly all science fiction computers and robots seem to have an ability to converse with humans in immaculate English. There are now devices on the market which strive to achieve similar speech, albeit of inferior quality — most sound like Metal Mickey.

In spite of such limitations, such devices have a value in adventures and educational software. I know of one such device for the VIC-20: ADMAN Speech Synthesiser (£49.95). The unit is in cartridge form and functions well.

LIGHT PENS

The VIC and 64 are particularly well endowed with input ports. One of the

on-board facilities is the ability to interpret input from a light pen.

When pointed at the screen, a light pen will detect the position of the raster scan and this can be converted to the position on the screen by a bit of software. Using this technique, you can, subject to the resolution of the system, detect the position of objects on the screen. Light pens are valuable for games and graphics.

From: Stack * (£25), Stonechip (£19.95) and DAMS/Computapix * (£26.99).

Stack Computers also markets a light pen built in the barrel of a toy rifle. This can be used for marksman-type games (£29.95) and some software houses have programs which use it.

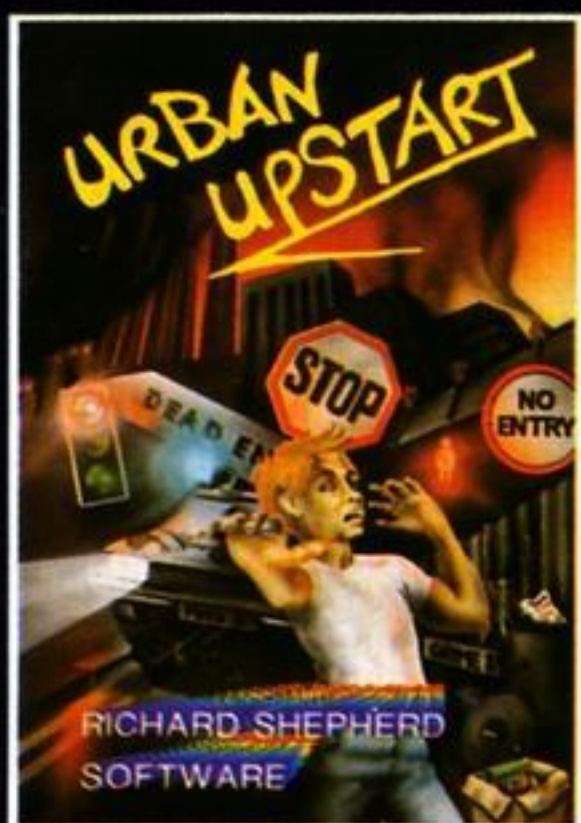
WEBB'S WINNERS

Well I hope this has given a good thumb-nail sketch of the add-on market. It's really up to you to get the specifications and make your own choice. For what it's worth, here are the items which I personally think are the best available:

RAM expansion Assembler	Stack Storeboard Mikro Assembler for either machine
Monitor	Zoom Monitor
Graphics aid (VIC)	VICKIT 2
Audiogenic Forth	both machines



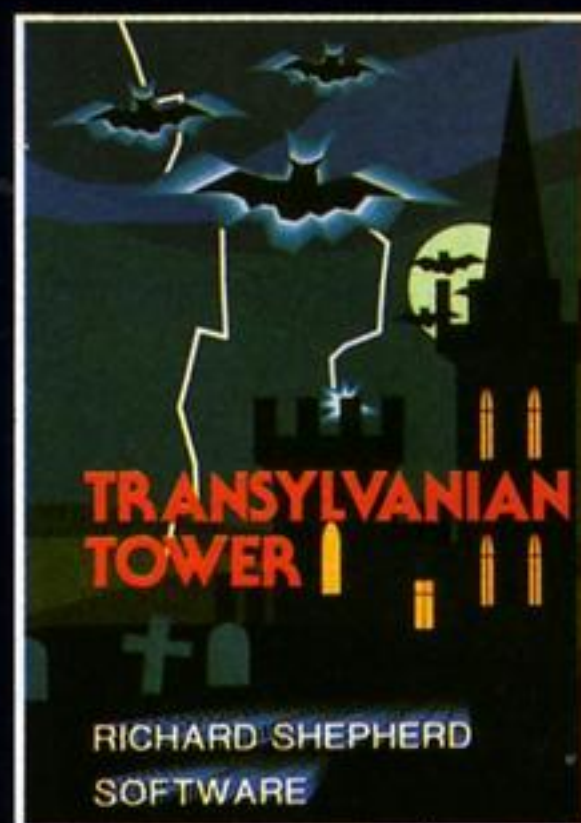
"ADVENTURES INTO IMAGINATION"



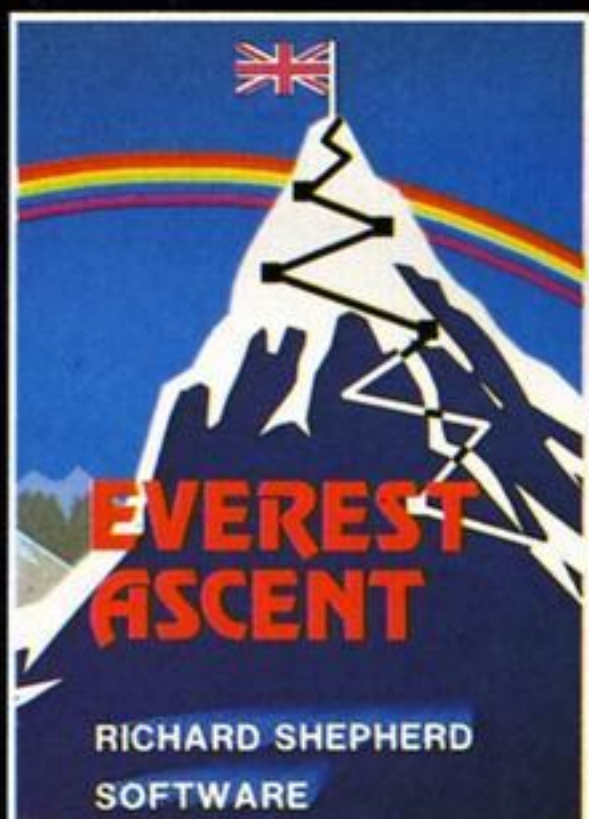
Your quest is to escape from Scarthorpe! ... a run down 20th Century Suburb where even the dogs carry flick knives. Where there's only one road in, and that's a one-way street. Not many people come to Scarthorpe, and even fewer leave ... the streets are deserted ... now is your chance to escape from over 90 graphic locations.
£6.50 Cassette £9.50 Disk



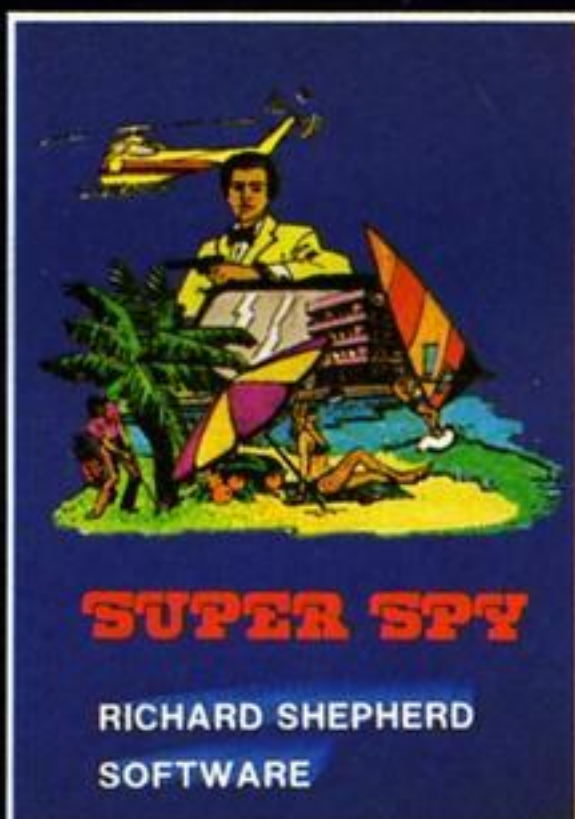
All these adventure games are also available in Cassette format for 48K Spectrum.



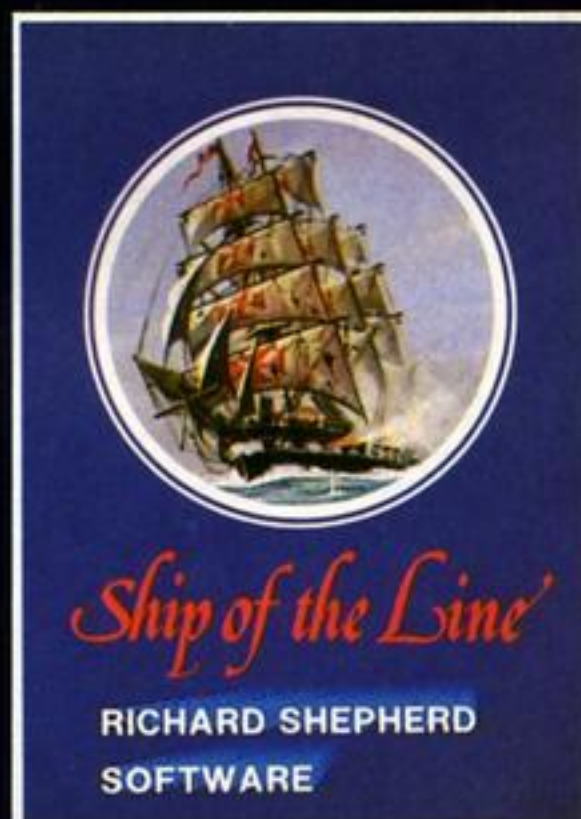
A spine chilling maze adventure ... enter via the dungeons ... navigate your way through 500 3-D rooms ... survive the swooping vampire bats ... reach the terrifying top ... and rid the world of the evil Count Kreeple! Can you survive the top of the Tower?
£6.50 Cassette £9.50 Disk



Conquer the world's highest peak in defiance of all the obstacles, man and nature can throw at you. Survive avalanches, cross bottomless crevasses, cope with wayward Sherpas — but don't run out of supplies!
£6.50 Cassette £9.50 Disk



Follow the trail of Dr. Death through complex puzzles, coded messages and 3-D mazes until you find his lair! But beware — even with your death-defying gadgets you may not live to tell the tale!
£6.50 Cassette £9.50 Disk



Command a sailing ship, juggle your supplies, crew and firepower. Fearlessly battle your way up the admiralty ladder, bribe Sea Lords as necessary until you make First Sea Lord!
£6.50 Cassette £9.50 Disk

RICHARD SHEPHERD SOFTWARE

ELM HOUSE, 23-25 ELM SHOTT LANE, CIPPENHAM, SLOUGH, BERKSHIRE.

CREDIT CARD HOTLINE 06286 63531 (24 HOURS)
PLEASE REMEMBER TO STATE DISK OR CASSETTE

All programs are sold subject to the condition that they may not, by way of trade or otherwise, be lent, hired out, resold or otherwise circulated without the written permission of Richard Shepherd Software Ltd.

PRIORITY MAIL ORDER

Prices include UK post & packing — overseas add £1.50

Name _____ Signature _____

Address _____

I enclose cash/cheque/PO: £ _____ payable to Richard Shepherd Software

Or debit my Access/VISA Card Number

Qty.	Game Ordered	Tick 64 Version Required	48K
		Disk	Cassette
		Disk	Cassette

Credit Card Hotline (06286) 63531

PLEASE REMEMBER TO STATE DISK OR CASSETTE

1/5/84

[illegible]

COPYRIGHT 1984 ALL RIGHTS RESERVED ©

COMPUTER AGENCIES LIMITED
29, Sun St., Hitchin, Herts.. SG5 1AT

COLR. LOCATION		SCRN. LOCATION															
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
0	55296	1024															
1	55336	1064															
2	55376	1104															
3	55416	1144															
4	55456	1184															
5	55496	1224															
6	55536	1264															
7	55576	1304															
8	55616	1344															
9	55656	1384															
10	55696	1424															
11	55736	1464															
12	55776	1504															
13	55816	1544															
14	55856	1584															
15	55896	1624															
16	55936	1664															
17	55976	1704															
18	56016	1744															
19	56056	1784															
20	56096	1824															
21	56136	1864															
22	56176	1904															
23	56216	1944															
24	56256	1984															
COLR. LOCATION		SCRN. LOCATION	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
			7	15	23	31	39	47	55	63	71	79	87	95	103	111	

[illegible]

WHERE TO FIND THEM

Adman Electronics, Ripon Way, Harrogate, North Yorkshire HG1 2AU

Audiogenic, P.O. Box 88, Reading, Berks
Commodore (VICSOFT), 675 Ajax Avenue, Slough, Berks SL1 4BG

Computer World, 99 Hilvertsweg, 1214 J B Hilversum, Holland

DAMS has changed its name to **Computapix**, Gores Road, Kirby Industrial Estate, Kirkby, Merseyside L33 4AU

JCL Software, 47 London Road, Southborough, Tunbridge Wells, Kent

Kempston, Unit 30, Singer Way, Woburn Road Industrial Estate, Kempston, Bedford

Kobra Micro Marketing, Unit 8, 1/7 Broomfield Road, West Ealing, London W17 9AP

Kuma Computers, Unit 12, Horseshoe Park, Horseshoe Road, Pangbourne, Berks RG8 7JW

Oxford Computer Systems, Hensington Road, Woodstock, Oxford OX7 1JR

Stack Computers, 290 - 298 Derby Road, Bootle, Liverpool L20 8LN

Stonechip Electronics, Brook Industrial Estate, Deadbrook Lane, Aldershot Hants

Supersoft, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ

If you own a VIC-20 or Commodore 64, look no further for add-ons. Our expert, Allen Webb, has sorted out the best from the rest. Take his advice before you buy



● Light Rifle from Stack

SOFTWARE

Commodore 64

HOME BUDGET

enables the home manager to keep track of finances by building up a file of incomes and expenditures; and using them in "what if" calculations. Income and expenditure (forecast or actual) can be produced in clearly tabulated form or as a bar chart if desired.

£9.95 inc VAT
Send for full brochure

Computers

Kuma

BC BASIC — At last the ultimate has arrived! A complete 9K Basic extension for the Commodore 64, supplied ROM. It features 85 new commands and 7 enhanced ones with full high-res, sprite sound and user defined graphics. **£57.50 inc VAT**

See us on PRESTEL * 2473222 #

DATABASE — can hold up to 360 records, comprehensive search facilities, unique browse option, special summary print for printing labels, mailing lists etc. Ideal for storing statistical information or stock details. **£24.50 inc. VAT**

COMET: KUMA TELECOM GOLD: KUM 001

SIMPLE ACCOUNTS (non VAT) — suitable for the club, society or self-employed person, also ideal for processing budgets and departmental accounts. Up to 15 expenditure and 5 income headings. 5 classes of payment. **£24.50 inc. VAT**

Telex 849462 TELFAC KUMA

PAINTPIC — complete color drawing and painting application using multi-color bitmap. It is designed to be easily used by young first-time computer enthusiasts but can also provide publishable work for professional artists. Send for brochure. **£19.95 inc. VAT**

Unit 12, Horseshoe Park, Horseshoe Road, Pangbourne, Berks RG8 7JW

FOOTBALL FORECAST — Stores up to seven league tables containing up to 130 teams. Enter results as required with automatic updating of league tables. Written by Professor Frank George, the forecasting expert. **£19.95 inc. VAT**

HORSE RACE FORECAST — written by Professor Frank George, the forecasting expert. It involves consideration of each horse in any chosen race. Weight assigned and distances of past and current races are taken into account. **£19.95 inc. VAT**



PHONE NOW (073 57) 4335
or SEND FOR DETAILS

Please tick box ☒ for information required, and send coupon to:

Kuma Computers Ltd.
12, Horseshoe Park
Horseshoe Road, Pangbourne
Berks. RG8 7JW

HARDWARE

<input type="checkbox"/> COMMODORE 64	<input type="checkbox"/>
<input type="checkbox"/> SIRIUS	<input type="checkbox"/>
<input type="checkbox"/> SHARP PC 1500	<input type="checkbox"/>
<input type="checkbox"/> SHARP 700	<input type="checkbox"/>

SOFTWARE

<input type="checkbox"/> SHARP A	<input type="checkbox"/>
<input type="checkbox"/> SHARP 3541	<input type="checkbox"/>
<input type="checkbox"/> SAGE 68000 System	<input type="checkbox"/>
<input type="checkbox"/> APRICOT	<input type="checkbox"/>
<input type="checkbox"/> EPSON HX-20	<input type="checkbox"/>
<input type="checkbox"/> EPSON QX-10	<input type="checkbox"/>
<input type="checkbox"/> NEWBRAIN	<input type="checkbox"/>
<input type="checkbox"/> SPECTRUM	<input type="checkbox"/>
<input type="checkbox"/> ELECTRONIC MAIL	<input type="checkbox"/>
<input type="checkbox"/> PRINTERS	<input type="checkbox"/>

NAME _____

ADDRESS _____

HCW60 POST CODE _____

Many articles and a lot of software has been written about sprites to create good-looking games and other programs on the Commodore 64. But user-defined graphics have scarcely had a mention.

These useful characters, whether seen as background extras or as moving objects, play an important part in any good game. This article sets out to cure the chronic lack of information about them and will show you effects you would have thought impossible on the 64.

Firstly, you have to have a good idea of how to create UDGs. Next time you have your 64 on, look closely at the screen characters. If your TV is good enough, you will see that they are not smooth, but are made up of joined dots.

Each character actually has 64 such dots (or pixels), in a layout of eight pixels across by eight up. These characters are fixed graphics, held in ROM, and so cannot be changed. However, you can change the position where the computer looks to see the patterns to display by using the following line:

```
POKE 53272, (PEEK(53272)
AND240) OR X
```

where X is that viewing position. If X is four, five, six or seven, fixed characters are shown. Any other number will move the viewing position to RAM, where you decide what is to be seen.

The most useful number is 15, as this places the viewing position farthest from your program, giving you the most room with definitions starting at location 14336.

When you first change

viewing position, all the computer sees is unused RAM, so all you'll see are some oddly patterned characters. Clearly, most games will need some form of text, so the first thing to do is to copy some text characters to RAM, Lines 40 to 140 do this by uncovering the hidden character ROM, and PEEKing and POKEing in machine code.

Now you are all set to add your own characters (the sprite chapter of your manual will help).

Creating them is fairly similar in method to creating a sprite: the bytes are filled in the same way, but their layout is different. A UDG is simply eight bytes, set out as rows containing bits. **Diagram 1** shows how this appears by showing character one as an example. As you can see, each byte total is the sum of the bit totals, from on bits. To change this, you simply POKE in your own numbers instead.

Program 2 is a simple character definer, aiding in design and adding of the bit totals. You move a flashing cursor backwards or forwards, using the space and return keys to empty or fill bits, respectively. When you have finished, press E, and use the byte totals at the side of the character.

Multicolour characters can also be created in the same way as with sprites. Here, sets of two bits are joined horizontally to make one screen pixel, but this can have four colours (one character colour, and three screen colours from locations 53281, 53282 and 53283). To switch multicolour mode on and off respectively, use the following lines:

Program 1 — uncovers the hidden character ROM

```
1 REM*****
2 REM*CREATING UDGs*
3 REM* BY *
4 REM* DAVID REES *
5 REM*****
9 REM* CODE FOR ROM READ *
10 FOR N=0 TO 33
20 READA:POKE49152+N,A
30 NEXT
40 DATA169,0,133,251,133,253,169,56
50 DATA133,252,169,208,133,254,160,0
60 DATA177,253,145,251,200,208,249
70 DATA230,252,230,254,165,252
80 DATA201,64,208,239,96
99 REM* RUN MACHINE CODE *
100 V=53248:POKE56334,PEEK(56334)AND254
110 POKE1,PEEK(1)AND251
120 SYS49152
130 POKE1,PEEK(1)OR4
140 POKE56334,PEEK(56334)OR1
150 POKEV+24,(PEEK(V+24)AND240)OR15
160 POKEV+32,0:POKEV+33,0
```

```
199 REM*[CLS]
200 PRINT" ";
210 FOR N=0 TO 2
220 A$=A$+CHR$(160+N)+CHR$(157)+CHR$(17)
230 NEXT
239 REM*[UP*3]
240 A$=A$+CHR$(163)+".TTT"
250 FOR Y=0 TO 4
260 FORN=0TO39:PRINTA$;:NEXT
269 REM*[HOME]
270 PRINT"  ";:NEXTY
280 FORN=0TO38:PRINTA$;:NEXT
289 REM*..[HOME]
290 PRINTLEFT$(A$,10)" "
299 REM* MAKE GRAPHICS PATTERNS *
300 X=15104:Y=31.9:Z=255:Q=170
310 FORN=0.1TO17STEP0.1
320 POKEX+M-N+0.1,85:K=N+0.1
330 FORM=NT0YSTEPN:POKEX+M,Z:POKEX+M-K,85:NEXT
340 NEXTN
360 FORN=0.1TO7STEP0.1
370 POKEX,Z:POKEX+31,0
380 FORM=NT0YSTEPN:POKEX+M,Z:POKEX+M-N,0:NEXT
390 NEXTN
400 FORN=0.1TO7STEP0.03
410 POKEX,170:POKEX+31,85
420 FORM=NT0YSTEPN:POKEX+M,Q:POKEX+M-N,85:NEXT
430 NEXTN
```

Program 2 — a character definer

```
1 REM*****
2 REM*UDGS DESIGNER*
3 REM* BY *
4 REM* DAVID REES *
5 REM*****
9 REM* CODE FOR ROM READ *
10 FOR N=0 TO 33
20 READA:POKE49152+N,A
30 NEXT
40 DATA169,0,133,251,133,253,169,56
50 DATA133,252,169,208,133,254,160,0
60 DATA177,253,145,251,200,208,249
70 DATA230,252,230,254,165,252
80 DATA201,64,208,239,96
99 REM* RUN MACHINE CODE *
100 V=53248:POKE56334,PEEK(56334)AND254
110 POKE1,PEEK(1)AND251
120 SYS49152
130 POKE1,PEEK(1)OR4
140 POKE56334,PEEK(56334)OR1
150 POKEV+24,(PEEK(V+24)AND240)OR15
160 POKEV+32,0:POKEV+33,0
199 REM*[CLS][BLUE][DWN]
200 PRINT"  "
209 REM*.[RVS OFF][ORANGE]..[BLUE][RVS ON]
210 A$="  "
219 REM*[RVS ON]
220 PRINT"  76543210 "
230 FOR N=0 TO 7
239 REM*[RVS ON]
240 PRINT"  "STR$(N);A$
249 REM*[UP]
250 PRINT"  ", " 0"
260 NEXTN
269 REM*[RVS ON]
270 PRINT"  76543210 "
280 PRINT"  ENTER E TO END"
285 PRINT"  "
290 S=1147:X=0:Y=0
300 P=S+X+Y*40
310 POKEP,PEEK(P)+128AND255
320 GETA$
330 POKEP,PEEK(P)+128AND255
340 IFA$=""THEN310
350 IFA$="I"THEN500
360 IFA$="II"THEN600
```


How to create good-looking games — thanks to UDGs

POKE 53270, PEEK(53270) OR
16
POKE 53270, PEEK(53270)
AND 239

Now that you have the characters, you can find out how versatile they are. UDGs can be endlessly repeated, like any character, so a few simple numbers and some PRINTing can be used to create great effects. For example, **Diagram 2** shows a UDG of part of a brick wall. It seems insignificant on its own, but can be repeated as many times as you like, to form a wall of any size.

Another simple improvement is to join several different characters together, to make one large character. Objects can be repeated as many times as you want, instead of having a limit of eight sprites.

However, UDGs become really impressive in this next part of the article. There are actually two types of UDG: hardware and software characters. The BBC and Spectrum use software characters by POKEing one byte of your (or its) design onto one byte of its high resolution screen. The '64 can do this, but it is easier to use hardware characters.

Here, the computer sees your

```

370 IFA$=" " THEN 700
380 IFA$=CHR$(13) THEN 800
390 IFA$<>"E" THEN 300
399 REM*[DOWN*4]
400 PRINT "XXXX"
410 END

500 X=X+1: IF X<8 THEN 300
510 X=X AND 7: Y=Y+1: IF Y<8 THEN 300
520 Y=Y AND 7: GOTO 300
600 X=X-1: IF X>-1 THEN 300
610 X=X AND 7: Y=Y-1: IF Y>-1 THEN 300
620 Y=Y AND 7: GOTO 300
700 B(Y)=B(Y) AND (255-2*(7-X)): GOSUB 900
710 POKEP, 122
720 GOTO 500
800 B(Y)=B(Y) OR 2*(7-X): GOSUB 900
810 POKEP, 250
820 GOTO 500
899 REM*[HOME][DOWN*2]
900 PRINT "XXXX"
909 REM*...[LEFT]
910 FOR N=0 TO 7: PRINT, B(N) " " : NEXT
920 POKE 15360+Y, B(Y)
930 RETURN

```

Program 3 — gives 64 by 64 resolution

```

1 REM*****
2 REM*UDGS HIGH-RES*
3 REM* BY *
4 REM* DAVID REES *
5 REM*****
9 REM* CODE FOR ROM READ *
10 FOR N=0 TO 33
20 READ A: POKE 49152+N, A
30 NEXT
40 DATA 169, 0, 133, 251, 133, 253, 169, 56
50 DATA 133, 252, 169, 208, 133, 254, 160, 0
60 DATA 177, 253, 145, 251, 200, 208, 249
70 DATA 230, 252, 230, 254, 165, 252

```

There's a chronic shortage of information about user-defined graphics on the Commodore 64. HCW regular David Rees sets out to cure this

(or its) character design, and displays it directly on the TV screen. If you want to change all of one type of UDG on the BBC, you would have to PRINT the new design over all the old characters. On the 64, you POKE directly to the character, and all of that type on the screen instantly.

This opens up many fantastic possibilities.

For instance, if you completely covered the screen with one repeated UDG, and changed the defined pattern of this character, the whole screen would change instantly. The latter part of program 1 shows some of the potential of this, by varying character patterns, and how the characters themselves can look. The result is displays which can only be graphically copied with super-fast drawing and calculations.

You can even use UDGs to create a small graphics screen, as **Program 3** demonstrates. This gives a 64 by 64 resolution (saving memory) using 64 characters. This allows the rest to be used for text. Another advantage is that the screen is easily moved, as it is really just a pattern of characters. The screen is easily expandable up to a resolution of 128 by 128, or any format in steps of eight. Simply POKE out a different pattern, and change the point draw routine.

Many other things can be done. You can manipulate characters in any way, turning them upside down, sideways, or even mixing their order. The possibilities are almost limitless.

All the above ideas can easily be used in games, whether they are to complement or replace sprites. The ideas can also be easily transferred to other computers, especially the VIC-20 with its similar hardware features.

Your imagination is the final boundary of the superb displays that are possible.

COMMODORE 64

```

80 DATA 01,64,208,239,96
99 REM* RUN MACHINE CODE *
100 V=53248:POKE56334,PEEK(56334)AND254
110 POKE1,PEEK(1)AND251
120 SYS49152
130 POKE1,PEEK(1)OR4
140 POKE56334,PEEK(56334)OR1
150 POKEV+24,(PEEK(V+24)AND240)OR15
160 POKEV+32,0:POKEV+33,0
187 REM*DRAW CHARACTER PATTERN*
188 REM*.[RVS ON].[RVS OFF][ORANGE].
189 REM*.[BLUE][RVS ON]
190 A$="  3  "      "
199 REM*[CLS][DWN],[RVS ON][BLUE]
200 PRINT"  3  "
210 FORN=0TO7:PRINTA$:NEXT
219 REM*[RVS ON]
220 P=1106:PRINT"  "
230 FORX=0TO7
240 FORY=0TO7
250 POKEP+X+Y*40,192+X*8+Y
260 NEXT Y,X
270 P=14336+192*8
280 FORN=0TO511:POKEP+N,0:NEXT
289 REM*[DWN]
290 PRINT"  A MINI HIGH RESOLUTION SCREEN"
299 REM*THE FUNCTION TO BE DRAWN*
300 FORC=0TOπSTEPπ/8:B=32*(π-C)/π
310 FORX=0TO63
320 Y=32-SIN(X/6+C)*B:GOSUB500
330 NEXT X,C
498 END
499 REM* DRAW POINT*
500 S=P+Y+INT(X/8)*64:A=2↑(7-(XAND7))
510 POKES,PEEK(S)ORA:RETURN

```

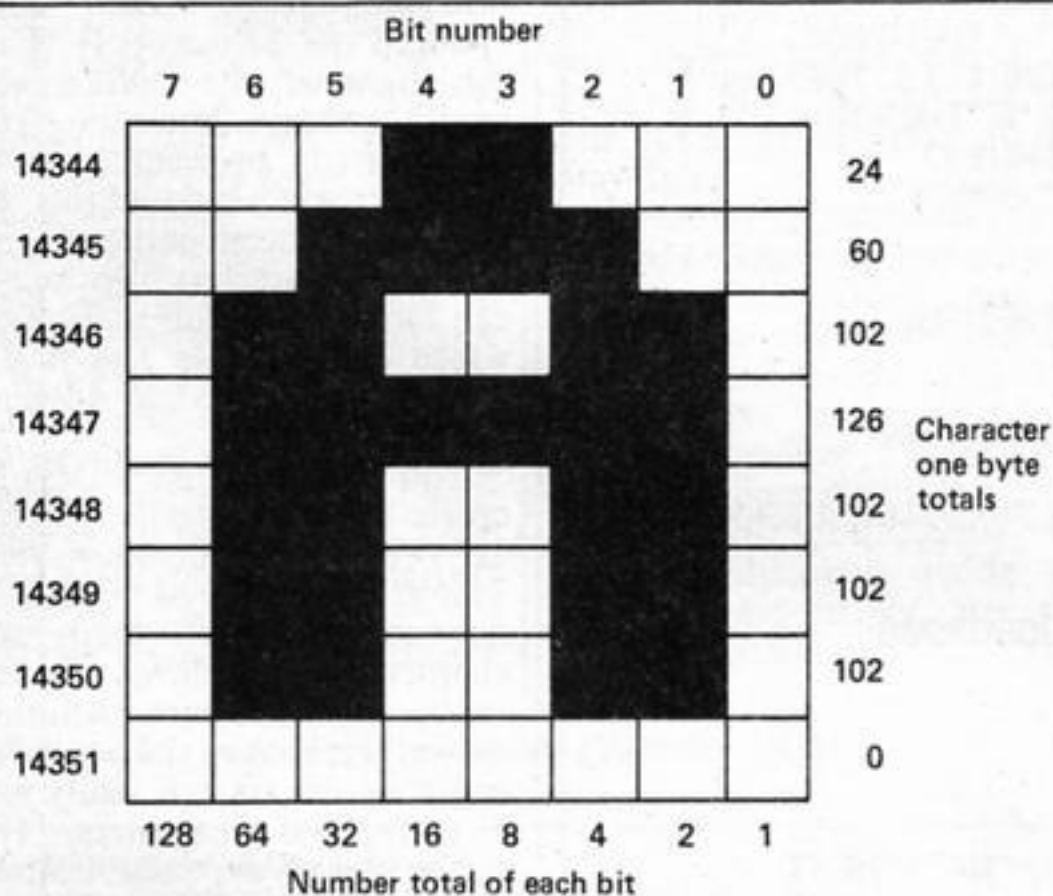


Diagram 1 — how characters can be built

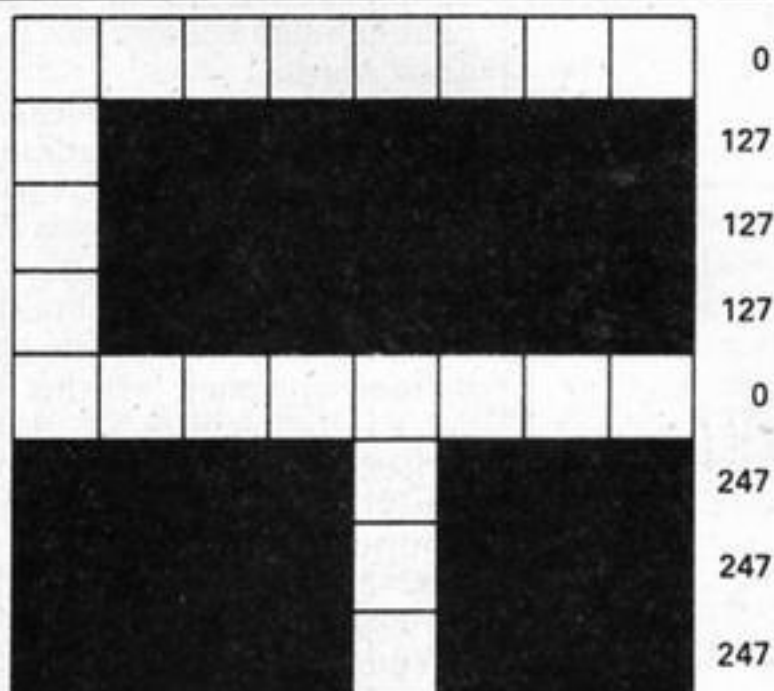


Diagram 2 — UDG of part of a brick wall

DUCKWORTH HOME COMPUTING

All books written by Peter Gerrard, former editor of *Commodore Computing International*, author of two top-selling adventure games for the Commodore 64, or by Kevin Bergin. Both are regular contributors to *Personal Computer News*, *Which Micro?* and *Software Review*.

SPRITES & SOUND ON THE COMMODORE 64

by Peter Gerrard

A complete guide to using the extraordinary features of the Commodore 64, together with a full working explanation of the chips that make it possible: the 6581 Sound Interface Device and the 6566 Video Interface Chip, together with the processor that makes it all tick, the 6510.

Sections on programming your own musical instruments, producing sprite and programmable character animation, make this the guide for users of the Commodore 64 who want to get the most from the special features of their computer.

£6.95

COMMODORE 64 GAMES by Kevin Bergin

This is a collection of 21 exciting programs specially written for the Commodore 64, including Golf, Snake, Air Attack, Draughts, Car Dodge, Tank Battle, and Minefield. An adventure game is also included as well as a program to enable you to devise your own version of Basic by re-defining keywords. Each program is accompanied by notes on its structure to enable you to modify or extend it.

£6.95

Other titles in the series include *Using the 64*, *12 Simple Electronic Projects for the VIC*, *Will You Still Love Me When I'm 64*, *Advanced Basic & Machine Code Programming on the VIC* and *Advanced Basic & Machine Code Programming on the 64*.

Write in for a descriptive leaflet (with details of cassettes).



DUCKWORTH

The Old Piano Factory, 43 Gloucester Crescent, London NW1 7DY
Tel: 01-485 3484

SOPHISTICATED GAMES FOR VIC-20 & CBM 64

VIC CRICKET Realistic game of skill and luck with all the major rules of cricket correctly interpreted. Full scorecard, printer and game save facilities. Needs 16K expansion. **£5.99***

LEAGUE SOCCER League championship game for 2 to 22 teams/players. Automatic fixtures, full action commentaries, match facts. League tables, results check, postponed games, etc. Non league matches also playable — the VIC will even make the cup draw. Printer and game save. Needs 16K expansion. **£4.99***

WHODUNNIT? Twelve guest have gathered for drinks at Murder Manor. However one of them has more than drinks on his mind. Thrilling detective game for 1 to 6 players, with genuinely different murder every time. You can even re-name the suspects! Needs 8K expansion **£4.99***

TOP OF THE POPS Money making game about the music business. Make your own records and see them climb the chart. Printer and game save facilities. Needs 8K expansion. **£4.99***

VIC PARTY Contains **MASTERWORD**, **A DAY AT THE RACES**, **GAME X** (Strip Poker), and **CONSEQUENCES**. Four games ranging from the serious to the ridiculous. All good fun — nothing offensive. Needs at least 3K expansion. **£5.99***

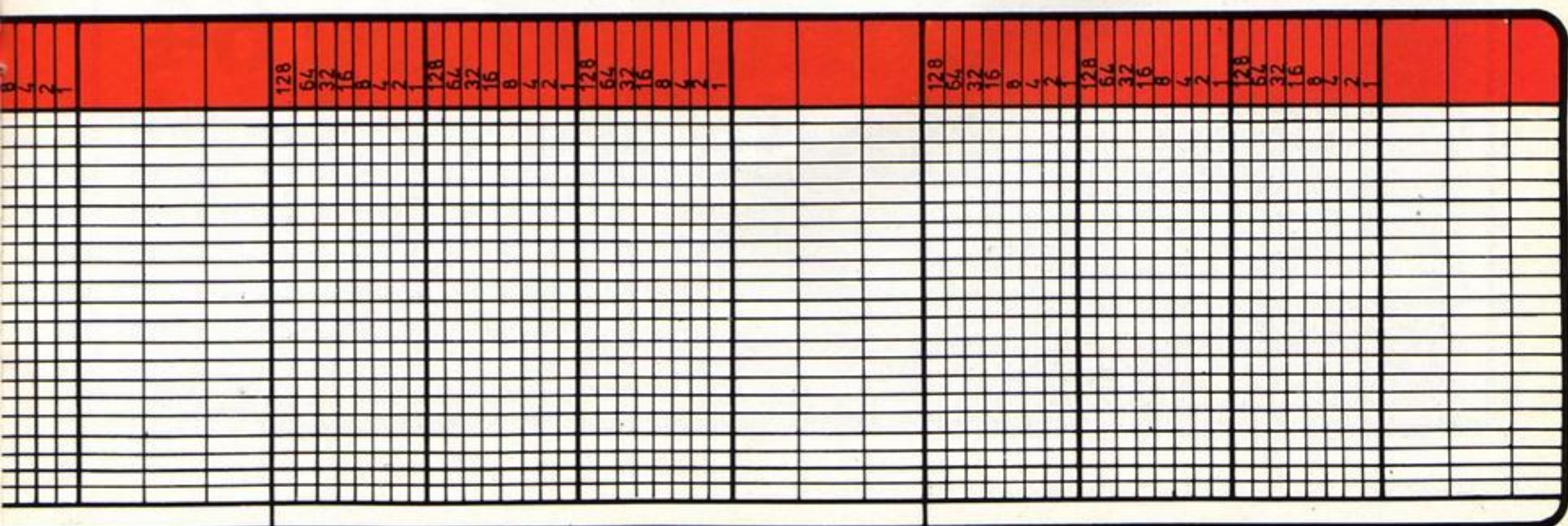
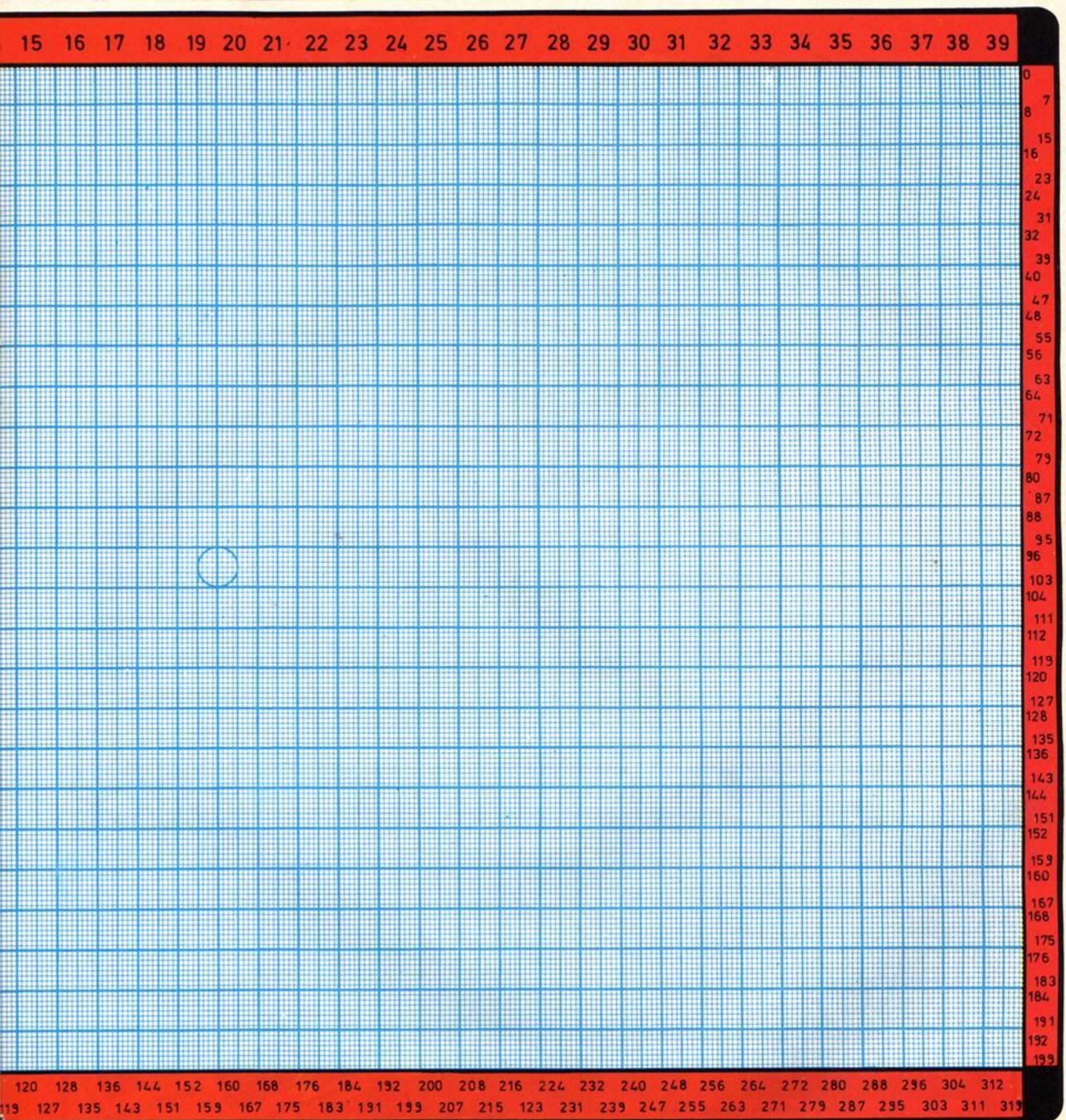
Commodore 64 versions coming soon

Available from

SOPHISTICATED GAMES,
Dept. HCW, 27 Queens Road, Keynsham,
Avon BS18 2NQ. Tel 02756-3427

WRITE FOR DETAILS OF OUR FULL RANGE

*P&P free (U.K. only). All games sold subject to our conditions of sale, which are available on request.



DRAGON/TANDY-£11.50
SPECTRUM-£17.25 inclusive

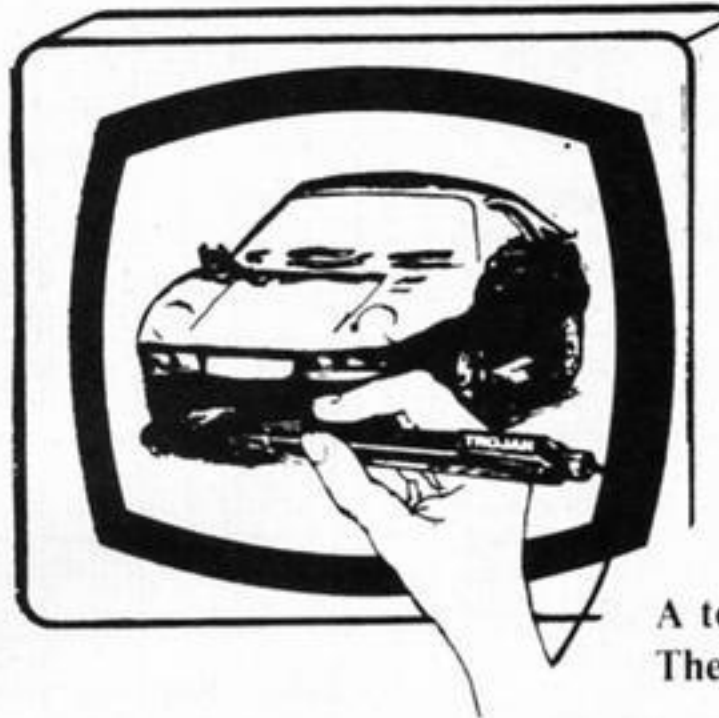
TOP VALUE LIGHT PEN

DRAGON 32/TANDY COLOUR 32K/SPECTRUM 48K

THE NEW ADVANCED PROGRAM
for the Trojan light pens include the following facilities-

- * DRAW BOX
- * DRAW CIRCLE
- * DRAW LINE
- * DRAW PICTURES FREEHAND
- * COLOUR FILL DESIGNATED AREAS
- * SAVE AND LOAD PICTURES TO AND FROM TAPE
- * FULL ERASE FACILITIES

All in Hi-Res screen in any of 4 colours for the Dragon/Tandy, and 8 colours for the Spectrum.



- * DATA ENTRY AND PROCESSING
- * MENU SELECTION AND CONTROL
- * GAMES PLAYING

This is a first class program which gives hints and tips on how to write programs for the pen. Ideal for many educational uses.

A top quality pen plus a first-class program.
The best value pen package available.

Send cheques/P.O. to:
TROJAN PRODUCTS
166 Derlwyn, Dunvant, Swansea SA2 7PF
Tel: (0792) 205491

TROJAN

Micro Computer Software & Accessories

ALSO AVAILABLE FROM GOOD COMPUTER DEALERS

ADMAN

ELECTRONICS

SPEECH SYNTHESISER NOW AVAILABLE FOR COMMODORE 64 PRICE AROUND £49.95

Vic 20 computers have been talking back to their owners for quite some time. Now, Commodore 64 users can have that same pleasure too—by getting an **ADMAN SPEECH SYNTHESISER**! It's word power is endless as there is no set vocabulary. Yet operation is simple. The 64 elements of English speech are pre-programmed to let you put your words together as soon as you switch on. Just imagine....you'll be able to program your own adventure games with characters that can actually talk. Many leading software houses are now developing programs that are compatible with the **Adman 64 Speech Synthesiser**.

First releases are:
Twin Kingdom Valley (Bug-Byte) Attack—Attack (Voyager) 3D Silicon Fish (Thor Computer Software)

The Commodore 64 finds its voice!

8k Ram Pack

16k Ram Pack

3 Port Expansion Motherboard

Speech Synthesiser

For Vic 20 users there are also 8k and 16k RAM PACKS and a 3 PORT EXPANSION MOTHERBOARD.

Prices around:

8k Ram Pack £29.95
16k Ram Pack. £39.95
Motherboard. £19.95
Speech Synthesiser . . £49.95

Adman computer accessories are available from all good computer shops. For further information, why not take a lead from our speech synthesiser.....ask for it! See you local dealer or simply post the coupon.

Dept. C, Adman Electronics Ltd., Ripon Way, Harrogate, N.Yorks, HG1 2AU. Tel. 0621 740972

Please send me information on Adman Vic 20 Accessories

Name _____

Address _____

HCW60

64/Home Computing Weekly

Adman Electronics Ltd. is a member of the Adam Leisure Group PLC

A great line up of 17 NEW titles... direct from CANADA

FOR ZX81, SPECTRUM, VIC 20, C64, ATARI

Just run your eyes over these new titles now available through "SOFTCHOICE LTD" the U.K. subsidiary of the well-known Canadian Software House INTERNATIONAL PUBLISHING & SOFTWARE INC. Purchase with confidence superb EDUCATIONAL, UTILITY and GAMES SOFTWARE!

EXCITING NEW GAMES FOR FAMILY FUN AND LEARNING FOR ZX81, SPECTRUM and COMMODORE 64



ADDING MACHINE
Additional facts for
ages 5-9 yrs.
For Spectrum,
Cassette £9.50
For C64
Cassette £9.50
Disk £14.95



TAKE AWAY ZOO
Subtraction facts for
ages 5-9 yrs.
For Spectrum,
Cassette £9.50
For C64
Cassette £9.50
Disk £14.95



TINY LOGO
The key to
understanding and
learning real
computer
programming!
For ZX81,
Cassette £5.95



SIGNALS & CODE
See and hear the
letters and numbers
in order! On demand,
randomly, in
messages, in score
tests! For ZX81,
Cassette £4.95



WRATH OF KONG
Only great agility and
cunning will outwit
Kong - Climb quickly
or Jane will perish!
For ZX81 &
Spectrum,
Cassette £5.95



SPEED SNAKE
Slither around mazes.
10 different mazes to
challenge your skill!
Deddy!
For ZX81,
Cassette £4.95



MR MUNCHEE
Race through 3
mazes, avoid the
Trolls! Exciting action
with graphics!
For ZX81,
Cassette £4.95

CHILDRENS' & HOME EDUCATIONAL GAMES for the COMMODORE 64, ATARI 400/800 DISKS Only, at £14.95 each incl.



**THE ALPHABET
FACTORY**
Two arcade-style
games that teach
children the alphabet!
C64 + Atari.
Ages 3-8 years.



MATCH UP
These high interest
games make learning
to read fun!
C64 only
Ages 3-8 years.



THE WORD BIRD
Three different games
each designed to
increase a child's
reading vocabulary!
C64 only
Ages 6-12 years.



TIME ZONE
Two activity games
that develop the
needed language
skills for successful
reading!
C64 only
Ages 6-12 years.

GREAT UTILITY AND BUSINESS SOFTWARE for ZX81, SPECTRUM, VIC 20, COMMODORE 64, ATARI



FASTWORD
Fast, versatile and
complete word processing
package by Dr Pearson.
For ZX81,
Cassette £8.50



FASTLOAD
any
programme up to 6
times faster than
normal! By Dr G.
Pearson.
For ZX81,
Cassette £8.50



BRIDGE
For all the family.
Sharpen your skills
with the computer's
bidding!
VIC 20, C64, & ZX81.



CALC-PRO
A great tool for home
or business!
complete financial
spreadsheet & runs
statistics programs
VIC 20 Cassette £9.50
C64 Disk £14.95



GRAPH-IT
An easy to use tool
to produce
graphical displays.
For VIC 20,
Cassette £9.50

HOW TO ORDER. BY TELEPHONE (01) 431 2494

If you are a Access holder, please telephone and
give your Card No., Name, Address and item required
for immediate despatch.

BY POST. To purchase any of the items listed above,
simply fill in the coupon below, write your Name,
Address, enclose your cheque or P.O. made
payable to: SOFTCHOICE LTD and post to us.

Post to: SOFTCHOICE LTD.
52 PLATTS LANE, LONDON NW3 7NT

Please send me the following items:
(Use separate sheet if space allocated not sufficient)

NO REQ.	TITLE	TOTAL COST
		£
		£
		£
		£
		£

I enclose my cheque/P.O. for £

I prefer to pay by ACCESS
(Delete which ever is not applicable)

Card No. _____
Signature _____
Name _____
Address _____

Please allow 7 to 14 days for delivery.
Card holders' address must be the same as coupon

SOFTCHOICE

SOFTCHOICE LTD.
52 PLATTS LANE, LONDON NW3 7NT.
TEL: (01) 431 2494. TELEX: 923753

COMMODORE 64

OXFORD PASCAL

YOUR FUTURE WITH COMPUTERS DEPENDS ON PASCAL

BECAUSE

- PASCAL is the world's most popular programming language after BASIC
- PASCAL is FAST... up to 20 times the speed of BASIC

WHAT IS OXFORD PASCAL?

OXFORD PASCAL is a COMPLETE implementation of the popular programming language PASCAL running on the Commodore 64

GRAPHICS & SOUND

With the OXFORD extensions to PASCAL you can programme dazzling graphics and astounding sound

WHAT DO I GET?

With the cassette version of OXFORD PASCAL you get:

- A powerful text editor for preparing PASCAL programs
- A resident compiler giving 14k of user RAM
- A powerful set of colour graphics and sound extensions to standard PASCAL

With the disk version of OXFORD PASCAL you get:

- All the above, PLUS
- A full disk to disk compiler exploiting the entire memory of the 64 for PASCAL programs.

HOW MUCH DOES OXFORD PASCAL COST?

Cassette version (resident compiler only) £14.95
Full disk compiler (1541, 4040, 8050, 8250 drives) £49.95
Prices are exclusive of VAT. There is also a small charge for post and packing.

Oxford Computer Systems
(Software) Ltd
Hensington Road,
Woodstock,
Oxford OX7 1JR, England
Telephone (0993) 812700
Telex 83147 Ref. OCSL

A HOME COMPUTING WEEKLY supplement 1 May 1984 Page seventeen

WE'VE got together with Bubble Bus for this week's free fun-to-enter competition. And there's a bonus for 24 of our 45 prize winners — free Bubble Bus T-shirts.

Bubble Bus, which specialises in software for the VIC-20 and Commodore 64, is based in surprising surroundings for a young up-to-date company.

Its headquarters is a centuries-old oak-beamed granary in Tonbridge High Street, Kent. "You have to duck as you enter each room," said the firm's Ann Lovejoy.

Among the prizes you could win is the Bubble Bus best-seller Hustler.

It's a faithful representation of pool and was written by in-house programmer Nick Strange, who is also the author of the company's table football game, Kick-Off.

Another big-selling CBM 64 title among the prizes is Bumping Buggies, a fast moving and addictive motor racing game.

It was written by 16-year-old schoolboy Richard Clark who will be joining the company full time in the summer.

Flying Feathers, also for the CBM 64, puts you in the rôle of a game warden. Armed with a shotgun, your challenge is to stop eagles stealing fish.

The latest of the company's games, it was written in-house by Terry Owen.

Bubble Bus was formed just a year ago by co-directors Mark Meakings and Sandy Marchant out of a company which sold business computers and software.

As well as games, Bubble Bus has a range of utilities and educational programs. Quiz Master, for the VIC-20 plus 3K memory expansion, has an educational theme and is one of our prizes.

Although most of the Bubble Bus range was written in house, Ann Lovejoy said the company welcomed submissions from free-lance programmers.

There's lots more in the pipeline from Bubble Bus, she promised. There will be three more games for the Commodore 64 in June and the

company is actively considering launching titles for another popular home computer.

How to enter

Study our wordsquare carefully and try to find all the Bubble Bus Software titles. All of them, plus more, are in the two lists from which the prizes will be selected.

Mark the titles you find with a semi-opaque felt-tip pen or by ringing them with a ballpoint pen.

Complete the coupon fully and clearly — if you are a winner it will be used as a label — and send the wordsquare with the coupon to us. Make sure you name your computer (Commodore 64 or VIC-20 only) and if you own a VIC give its extra memory, if any.

You must write in large figures on the back of the sealed envelope the number of software titles you found. And please do not enclose anything else.

You may enter as many times as you wish, but each entry has to be on the official coupon and wordsquare and in a separate envelope. Incomplete entries cannot be considered.

Closing date is Friday May 18, 1984, at first post.

The senders of the first 45 entries opened at random, regardless of computer owned, will win the prizes. The first 24 of the 45 winning entries will also win their senders a Bubble Bus T-shirt.

The prizes will arrive from Bubble Bus within 28 days — or earlier — of the publication of the issue of Home Computing Weekly containing the names of the winners and the solution.

Address your entries to Bubble Bus Software competition, Home Computing Weekly, No.1 Golden Square, London W1R 3AB.

The prizes

Each of our 45 winners will get a prize package of three games for the VIC-20 — state your computer's extra memory, if any, on the coupon — or the Commodore 64, all drawn from the list below.

And there's an extra for the senders of the first 24 correct entries we draw. As well as three games tapes, they will get a free Bubble Bus T-shirt in bright yellow with the firm's logo in red.

The prize packages will be drawn from the following cassettes, each of which has a retail price of £6.99:

Commodore 64	
Hustler	Exterminator
Kick-Off	Widows Revenge
Bumping Buggies	Flying Feathers Quizzer
VIC-20	
Antimatter	The Catch
Splatter	Quiz Master
Exterminator	

Note: All the VIC-20 games run on the unexpanded computer, except for Quiz Master, which requires 3K expansion.

Bubble Bus Software Competition

Entry Coupon

Name _____

Address _____

_____ post code _____

Computer owned (Commodore 64 or VIC-20 only. If VIC, state extra memory, if any): _____

Number of titles found _____

Complete clearly and fully — if you are a prizewinner this will act as a label. Post to Bubble Bus Software competition, Home Computing Weekly, No.1 Golden Square, London W1R 3AB. Follow carefully the How to Enter section, including writing the number of titles you found on the back of your envelope.

B	K	O	E	S	U	G	A	S	W	Y	D	X	F	S	P
Q	U	I	Z	M	A	S	T	E	R	I	Q	R	H	J	A
A	T	M	T	G	F	C	X	B	P	C	W	E	W	I	C
E	K	N	P	J	X	R	Z	W	F	I	Q	L	D	R	Z
X	D	J	K	I	C	K	—	O	F	F	G	H	H	O	G
T	V	E	C	B	N	M	O	M	O	P	L	F	V	S	N
E	H	W	P	V	B	G	F	Q	T	O	Y	V	X	B	O
R	U	E	M	D	H	V	B	J	D	P	Y	Z	G	N	F
M	L	A	C	K	A	V	E	U	X	M	I	H	S	U	U
I	X	U	E	A	F	H	O	N	G	I	K	L	Q	O	P
N	G	D	E	C	T	J	Y	C	R	G	R	N	E	N	S
A	K	X	T	P	L	C	S	M	Z	I	I	G	Q	T	A
T	U	W	M	I	W	C	H	U	S	T	L	E	R	M	O
O	D	B	N	J	L	A	R	K	R	J	T	B	S	V	Z
R	Z	H	X	Y	E	P	W	L	K	F	Q	M	G	O	V
Y	V	D	K	B	J	C	L	T	N	B	H	U	R	B	G

It's easy to complain about advertisements.

The Advertising Standards Authority. ✓
If an advertisement is wrong, we're here to put it right.

A.S.A. Ltd., Brook House, Torrington Place, London WC1E 7HN.

QUICKSHOT II

OUR DOWN TO EARTH PRICE
JUST £10.95

COMPLETE WITH SPECTRUM INTERFACE
WORKS WITH ALL KEMPSTON COMPATIBLE GAMES
ONLY £19.99

NOW ALSO AVAILABLE COMPLETE WITH BBC INTERFACE
HARDWARE INTERFACE PLUGS STRAIGHT INTO ANALOGUE PORT
£20.99

01-952 0451

Adams World is North London's No1 software retailer. Over 2,000 tapes, cartridges, discs, in stock. Software, books and "Add-Ons" for CBM 64, Spectrum, BBC, Vic 20, Oric, Dragon, Electron and ZX81. Adams World opens Monday to Saturday 9-6 and it's two doors down from Edgware Tube Station. Credit card sales. 01-952 0451.

01-952 0451
ADAMS WORLD OF SOFTWARE LTD
190c STATION ROAD
EDGWARE
MIDDLESEX
HAB 7AR

Adams World

Now with RAPID FIRESWITCH

UNTIL WE HAVE A DEFENCE AGAINST QUICKSHOT II WE MUST ABORT INVASION PLANS!

NEW IMPROVED PISTOL GRIP

FOUR STABILIZING SUCTION CUPS

FIRE BUTTON AND FRONT TRIGGER

BOOM!

BOOM!

BOOM!

RED ALERT

NO FEAR Quick Shot II is HERE!

Moment's Later....

PLEASE RUSH ME THE FOLLOWING

.....QUICKSHOT II's at.....£10.95 Tot..£ : p
.....QUICKSHOT SPECTRUM at £19.99 Tot..£ : p
.....QUICKSHOT BBC at.....£20.99 Tot..£ : p

SIGNATURE.....

.....SPECTRUM INTERFACE only at.....£12.95 Tot..£ : p
.....BBC INTERFACE ONLY at.....£13.95 Tot..£ : p
.....ADD 50p POST & PACKING PER ITEM.....Tot..£ : p

TOTAL enclosed = £ : p.....(payable to ADAMS WORLD)

ACCESS-VISA NO

SEND NOW FOR URGENT RETURN.

NAME.....

ADDRESS.....

TOWN.....

COUNTY.....P.CODE.....

Trapped! Only you can save the lovely Rapunzel...



Can you rescue the lovely Rapunzel? Like the legend, she has been bricked up in a tower by an evil witch. And the only way out is a window high above ground.

How it works part 1

5 clears screen, prints prompt
18 protect top of memory
19 move ROM to RAM
20 redefine characters
40-80 data for new characters
100-115 print instructions
120-130 end of program and wait for space bar

So she grows her hair so that her beau can climb up and rescue her.

At the start of this two-part VIC-20 game you'll see Rapunzel at the top of her tower on the left and you're at the bottom right.

To make Rapunzel's hair grow you have to catch the combs, razors and tufts of hair that rain down on you. You gain five points, and Rapunzel's hair grows a little more, for each one that you catch.

part 2

8 set keyboard repeat
10-120 set up screen
170-190 move the man
800-820 end of game routine
950 re-start program

Each missed catch loses you a point and after you have missed five scissors will appear and cut off two sections of hair.

When Rapunzel's hair has grown to the ground, you're able to climb up to her. The next games will be faster.

Try it and see.

Variables

N time delay loop parameter, decreased as screens are completed
M your position
D object position
S flag for direction of travel
CO added to M,D for colour position
J random choice of object
H number of misses

● As usual, we have inserted REMarks in the lines above control characters as a guide to use when you are typing in the programs. These REMs should not be entered — you may run out of memory. Wherever possible, use abbreviations for keywords as given in your manual. This will ensure that the lines fit, save memory and make games run faster.

A legend is brought to the screen in David Sanders' two-part game for the unexpanded VIC-20. Are you quick enough to rescue Rapunzel?

VIC-20 PROGRAM

Listing 1 — set up graphics

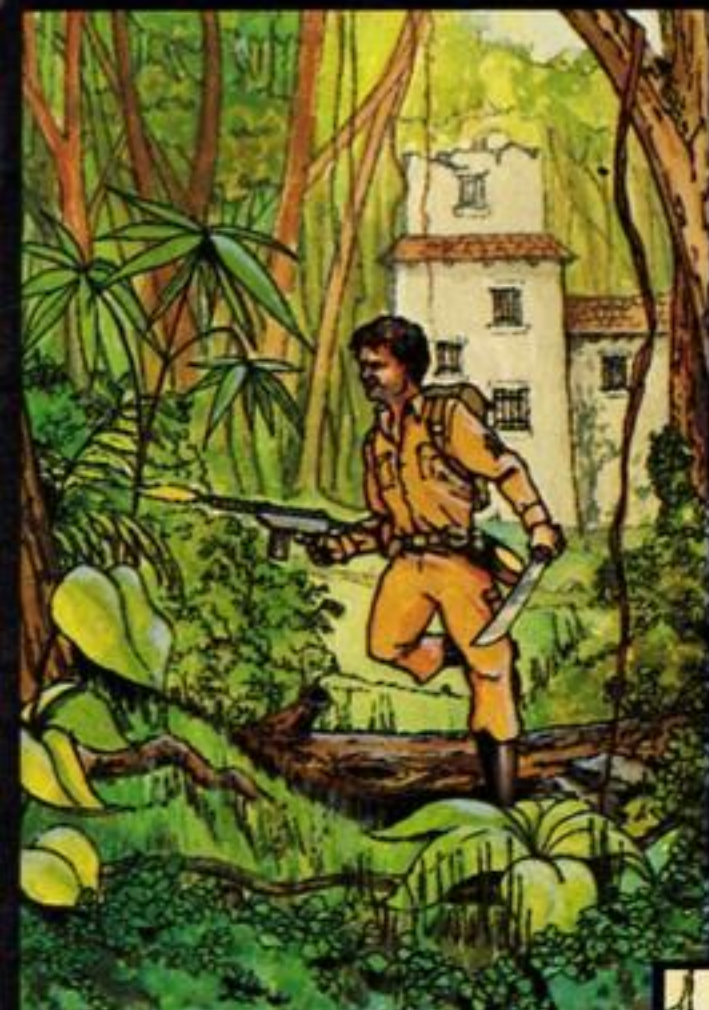
```
5 PRINT"#####PLEASE WAIT WHILST THE GRAPHICS ARE FIXED"
18 POKE52,28:POKE56,28
19 FORI=7168TO7679:POKEI,PEEK(I+25600):NEXT
20 FORI=7168TO7679:READA:IFA<>-1THENPOKEI,A:NEXT
40 DATA8,28,8,28,28,28,8,8,9,29,10,60,92,28,34,65
45 DATA16,184,80,60,58,56,68,130,48,48,48,48,48,48,48
50 DATA0,0,254,254,170,170,170,170,24,56,84,146,162,33,33,0
55 DATA24,48,112,248,156,14,7,3,255,153,153,153,153,153,255
60 DATA0,0,192,192,96,96,48,48,20,20,37,41,41,40,255,255
65 DATA60,60,60,60,40,40,20,20,255,222,140,220,220,140,220,255
70 DATA255,123,49,59,59,49,59,255,255,255,240,120,60,30,15,255
75 DATA255,60,30,15,135,195,225,255,14,17,63,224,224,62,17,14
80 DATA192,112,28,7,3,14,56,224,0,0,28,255,127,0,0,0,-1
90 REM [CLR]
100 PRINT"█":POKE36879,152
101 PRINT"#####RAPUNZEL#####"
102 PRINT"█SAVE RAPUNZEL FROM THE TOWER.CATCH THE COMBSRAZORS AND HAIR"
103 PRINT"█YOU GET FIVE POINTS & RAPUNZEL'S HAIR GROWS A LITTLE FOR EACH ONE"
104 PRINT"█MISS FIVE OBJECTS AND THE SCISSORS WILL COME"
105 PRINT"█ IF RAPUNZEL'S HAIR REACHES THE BOTTOM OF THE TOWER,A BONUS OF 10
0 IS GIVEN"
106 PRINT"#####PRESS SPACE BAR#####"
107 GETA$:IFA$=""THEN107
108 PRINT"█THE SPEED OF THE GAME IS DETERMINED BY THE"
109 PRINT"█ NO. OF SCREENS THAT HAVE BEEN COMPLETED."
110 PRINT"#####USE THESE KEYS TO MOVE"
111 PRINT"#####Z'-LEFT"
112 PRINT"#####/'-RIGHT"
113 REM[2 CRSR DOWN][BLU][RVS ON][RED][RVS OFF][BLU]
115 PRINT"#####PRESS SPACE BAR#####"
120 POKE198,0:WAIT198,1
130 PRINT"█PRESS SHIFT/RUN TO LOAD PART TWO"
```

Listing 2 — main game

```
8 POKE36879,56:POKE650,128
9 REM[CLR]
10 PRINT"█":M=8155:H1=7772:H=0:POKE36869,255
12 FORI=7792TO8056STEP22
14 POKEI,11:POKEI+1,12:POKEI+CO,6:POKEI+CO+1,6:NEXT
16 FORI=7708TO8148STEP22:POKEI,7:POKEI+15,7:POKEI+CO,7:POKEI+15+CO,7:NEXT
18 POKE7771,10:POKE7749,9:POKE38491,15:POKE38469,15:POKE7750,8:POKE7750+CO,0
19 POKE7772,3:POKE7772+CO,0
20 POKEM,0:POKEM+CO,0
100 D=INT(RND(1)*13)+7709
110 S=INT(RND(1)*2)+1
120 J=INT(RND(1)*3)+4:IFS=1THEN190
140 POKED,32:IFPEEK(D+23)<>32THEN170
150 D=D+23:POKED,J:POKED+CO,0
155 POKE198,0:FORDL=0TON:NEXT
160 IFD>8169THENPOKED,32:S=3:H=H+1:SC=SC-1:GOTO260
165 GOTO260
170 IFPEEK(D+23)=10RPEEK(D+23)=10RPEEK(D+23)=2THENPOKED,32:GOSUB300:S=3:GOTO260
180 S=1:GOTO260
190 POKED,32:IFPEEK(D+21)<>32THEN230
200 D=D+21:POKED,J:POKED+CO,0
205 POKE198,0:FORDL=0TON:NEXT
210 IFD>8169THENPOKED,32:S=3:H=H+1:GOTO260
225 GOTO260
230 IFPEEK(D+21)=00RPEEK(D+21)=10RPEEK(D+21)=2THENPOKED,32:GOSUB300:S=3:GOTO260
240 S=2:GOTO260
```


PARAMOUNT SOFTWARE

for Connoisseurs with COMMODORES



COUNTDOWN

Time is important.
Accuracy essential.
Courage mandatory.
But, above all, Nerve
is the prime attribute
needed for your
mission as an agent
in the crack S.M.U.
A Superb Arcade /
Graphical Adventure.
VIC 20 8K or 16K
Expansion. Keyboard
or Joystick.

£5.50



OUTBACK

".....an addictive
game...the Graphics
are very good indeed
...there's also a lot of
very good program-
ing." Personal Computer
News, Dec22-Jan 4 1984.

Can you use the very
sophisticated defence
set-up to beat off the
cunning Swagmen?

Pure Machine Code
Action. Fully Featured.
Superb colour and
Graphics.

A game with a difference.

Any VIC20 Joystick.

COMMODORE 64

Keyboard or Joystick.

£5.50 & £7.50

CHOCABLOC

A fast moving, pure
Machine Code action
game, with Chocabloc
our hero trying to sort
out some Real Cool
Choc Bars — until every-
thing goes crazy and the
action is on!
Arcade standard.
Fully Featured.
Excellent sound and
graphics.

VIC 20 8K or 16K
expansion.

Keyboard or Joystick.

£6.50



MEGAWARZ

Where does your fantasy
go when your mind leaves
your body?

Megawarz will take you
there you can be sure.
High resolution, multi-
colour graphics.
Sprite graphics.
Synthysound.
Pure Machine Code
action.

Arcade Standard.
A magical planetary
trip.

COMMODORE 64

Keyboard or Joystick.

£7.50



JOGGER

Truly a jogger amongst
joggers. If you have trotted
with the rest, now run with
the best.

Machine Code action.
Superlative sound.
Creative Colour.

A quality programme
from Paramount.

Any VIC 20. Joystick.

£5.50

Selected titles are available
at **BOOTS, JOHN MENZIES,**
major department stores and
computer stores nationwide.

Dealer, export and
distribution enquiries to
Bob Horsham
(Paramount)

Tel: 0642 604 470 (day)

0642 316 211 (night)

Authorised distributors:

Centresoft Ltd. - Tel: 021 520 7591

Tiger Distribution - Tel: 051 420 8888

Pilonmist Ltd - Tel: 0924 264412

Websters Software Ltd - Tel: 0483 62222

Mail order — despatched by
return, post-paid. Please
make cheques/POs payable
to:

PARAMOUNT SOFTWARE

67 Bishopton Lane, Stockton, Cleveland, TS18 1PU.

CHOCABLOC	£6.50	[]	Name.....
OUTBACK	£5.50	[]	Address.....
OUTBACK 64	£7.50	[]
COUNTDOWN	£5.50	[]
MEGAWARZ	£7.50	[]
JOGGER	£5.50	[]

I enclose cash/cheque/P.O. for £.....


Overseas orders please add £0.50 per item

ANIROG

*The Name For
Quality And
Innovation*

CYBOTRON

Over 100 screens of superb
arcade action!

COMMODORE  £7.95

Also available on Disk at £9.95



TRADE ENQUIRIES: ANIROG SOFTWARE LTD. 29 WEST HILL DARTFORD KENT (0322) 92513/8
MAIL ORDER: 8 HIGH STREET HORLEY SURREY 24 HOUR CREDIT CARD SALES HORLEY (02934) 6083
PAYMENT BY CHEQUE P.O. ACCESS/VISA